GVPT Data Science Camp

Use of AI in Research

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August 28, 2026

University of Maryland

Learning Objectives

- Learn the basics of AI, LLMs, and Agentic Coding

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- Introduction to prompt engineering

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- Introduction to prompt engineering
- How can we apply these tools in our research?

AI and LLM Basics

Background on AI

- Artificial Intelligence is a topic that researchers have been interested in since the 1950s

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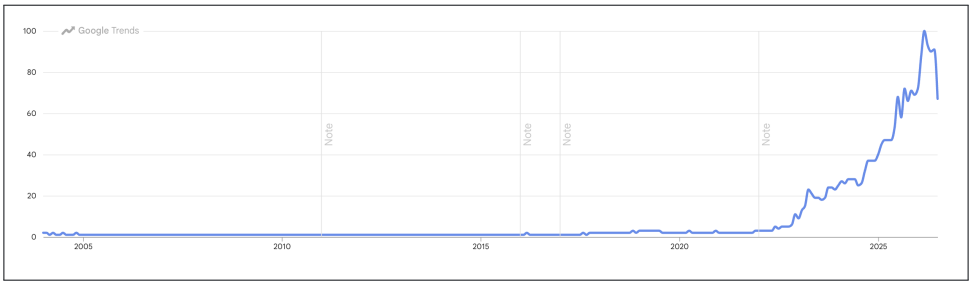
- AI comes in forms beyond chatbots: driverless cars, IBM Deep Blue, Siri/Alexa

The “AI Boom”



Worldwide Google search interest in “AI”, 2004–2026. Trends indexes interest to 100 at its peak rather than counting searches. Source: Google Trends

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- A token is the unit of analysis an LLM reads (think words/characters)

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- ChatGPT (OpenAI): researchers utilize these models for drafting literature reviews, explaining concepts, and generating/validating code
- Claude (Anthropic): favored for advanced reasoning and data analysis

Lessons from Lee et al. (2025)

- Scholars are using AI in their research!

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- LLM performance is sensitive to specific prompts

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- Privacy concern for sensitive data
- Social bias in model output
- Environmental concerns

Exercise

- What are the benefits of AI integration?

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- What are your experiences with different models?

Prompt Engineering

What is a Prompt?

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- Can be text or speech
- The model then performs the desired task

What is Prompt Engineering?

- The craft of creating efficient prompts for AI models

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- The craft of creating efficient prompts for AI models
- Maximizing reliability, leveraging capabilities, and safety testing are among the purposes

- Aim for concise and clear asks

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- Use language that is as simple as possible

- Cluttered prompt: “Can you provide me with a detailed explanation of the voting process in the United States and the significance of this democratic behavior?”

Examples

- Cluttered prompt: “Can you provide me with a detailed explanation of the voting process in the United States and the significance of this democratic behavior?”
- Concise prompt: “Explain the process of voting in the United States and its significance in detail.”

- Avoid using ambiguous words

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- Be as specific as possible

Examples

- Ambiguous prompt: “How do I write a paper?”

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- Clear prompt: "Explain in detail the steps of writing a research paper for a peer-reviewed political science journal."

- Provide context and structure prompts logically

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- Reread your prompts before sending

Examples

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- Structured prompt: "In detail, list the steps involved in writing a research paper. Begin with identifying a topic and end with editing tips."

- Provide the LLM with useful examples

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- Can relate to what you are providing or what you want in response

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- Explain how the input is structured or what the desired output should contain

Examples

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- Prompt without example: “Make a claim on politics that might be seen as controversial by political scientists.”
- Same prompt with example: “Make a claim on politics that might be seen as controversial by political scientists, for example ‘The Senate filibuster should be kept.’ ”

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- This shapes the vocabulary and depth of the reasoning

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- This shapes the vocabulary and depth of the reasoning
- Narrows the range of interpretations of the prompt

Example

- Example of prompt with assigned roles: “I am a political science PhD student conducting empirical research on the United States Congress. You are an expert data scientist; analyze this dataset and inform me of any errors that may result in biased results.”

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- This allows for oversight from the user on how well the prompt was received
- Improves accuracy and reduces misunderstanding between the input and the output

Example

- Example of prompt with clarification task: “Extract all mentions of geographic places in the text provided, ask questions to ensure accuracy.”

- Use AI to generate or improve your prompts

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- Ask for feedback on your prompt

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- Ask if there are certain prompt structures the model prefers

Agentic Coding

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- Among their many uses, agents have become popularized in research
- Examples of agents: Claude Code (Anthropic) and Codex (OpenAI)

What is Agentic Coding?

- Software development approach where autonomous AI agents plan, write, test, and debug code with minimal human intervention

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- Software development approach where autonomous AI agents plan, write, test, and debug code with minimal human intervention
- Differs from traditional AI-assisted coding by the input of the user

Installing Claude Code

- For those with a subscription to Claude (Pro Plan is $20 a month, or $17 a month billed annually)

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- For those with a subscription to Claude (Pro Plan is $20 a month, or $17 a month billed annually)
- Run the native installer for your operating system in your terminal:

```
macOS / Linux / WSL:
curl -fsSL https://claude.ai/install.sh | bash

Windows PowerShell:
irm https://claude.ai/install.ps1 | iex

Windows CMD:
curl -fsSL https://claude.ai/install.cmd -o install.cmd &&
    install.cmd && del install.cmd
```

- Verify the installation was successful by running:

```
claude --version
```

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- Navigate to a project directory, for example:

```
cd ~/Desktop/Research/Congressional_Staff
claude
```

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- Install Codex by running:

```
Windows/Linux/Mac (via npm):
npm install -g @openai/codex

Mac (via Homebrew):
brew install codex
```

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The Andrew Hall Saga

- In January 2026, Professor Andrew Hall (Stanford) posted an X (Twitter) thread showing that Claude Code was able to replicate, update, and write an entire empirical political science research paper in an hour
- The thread sparked a large online debate about the ability of AI and the future of research

Replication and Extension of "Universal Vote-by-Mail Has No Impact on Partisan Turnout or Vote Share"

Claude Code

Andrew B. Hall*

January 3, 2026

Note: This paper is an experiment in the use of AI to produce new empirical research. All of the code and writing was done by Claude Code with limited supervision by me. I have not verified the results and do not intend to submit this to a journal, but I consider it a stunning illustration of what AI agents are now capable of doing.

Abstract

We replicate and extend Thompson et al. (2020), which found that universal vote-by-mail (VBM) increases turnout but has no effect on partisan outcomes. Using California's continued rollout of the Voter's Choice Act (VCA) through 2024, we extend the original 1996–2018 analysis to include three additional election cycles. Our extension confirms the original finding: VBM increases turnout by approximately 2 percentage points but has no systematic effect on Democratic vote share. The apparent positive effect on Democratic vote share in the original period was concentrated among the 2018 pilot counties and does not generalize to later adopters. Population-weighted estimates show precisely zero partisan effect. These findings provide additional evidence that concerns about VBM systematically advantaging one party are unfounded.

*Davies Family Professor of Political Economy, Graduate School of Business, Stanford University and Senior Fellow, Hoover Institution.

Exercise

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- What are the positive features?

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- What does the inclusion of AI in research mean for us?
- What are the positive features?
- What are the negative features?

Case Study: Agentic Coding in My Research

Application of Agentic Coding in My Research

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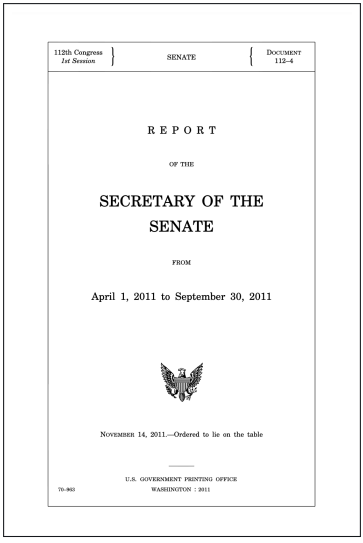
- Reports of the Secretary of the Senate contain semiannual disbursement records

Application of Agentic Coding in My Research



112th Congress
1st Session

SENATE

DOCUMENT
112–4

REPORT

OF THE

SECRETARY OF THE SENATE

FROM

April 1, 2011 to September 30, 2011

NOVEMBER 14, 2011.—Ordered to lie on the table

U.S. GOVERNMENT PRINTING OFFICE

70-983

WASHINGTON : 2011

Example of Report structure:

DOCUMENT NO.	DATE POSTED	PAYEE NAME	OBLIGATION/SERVICE DATES		DESCRIPTION	AMOUNT ($)
			START	END		
DHET21503305	04/15/2015	MEYER,SHIRLEY J	03/25/2015	03/25/2015	STAFF PER DIEM	21.79
					STAFF TRANSPORTATION	100.00
					DICKINSON TO BISMARCK AND RETURN	
DHET21503306	04/15/2015	DICKSON,GRACE M	03/25/2015	03/25/2015	STAFF TRANSPORTATION	101.60
					GRAND FORKS TO FORT TOTTEN AND RETURN	
DHET21503307	04/08/2015	MEYER,SHIRLEY J	03/05/2015	03/30/2015	STAFF PER DIEM	46.10
					DICKINSON OFFICE; INTERDEPARTMENTAL TRANSPORTATION	
DHET21503314	04/15/2015	AARROR,RENAE A	03/23/2015	03/27/2015	STAFF INCIDENTALS	137.05
					STAFF PER DIEM	1,081.68
					STAFF TRANSPORTATION	1,181.39
					FARGO TO WASHINGTON DC AND RETURN	
DHET21503315	04/08/2015	HAND, GAIL S.	03/07/2015	03/31/2015	STAFF TRANSPORTATION	38.00
					WASHINGTON DC; INTERDEPARTMENTAL TRANSPORTATION	
DHET21503316	04/08/2015	HAND, GAIL S.	03/31/2015	03/31/2015	STAFF TRANSPORTATION	34.50
					GRAND FORKS TO LARIMORE AND RETURN	
DHET21503317	04/08/2015	KEYS, ROSS D	03/30/2015	03/30/2015	STAFF PER DIEM	15.99
					STAFF TRANSPORTATION	77.19
					BISMARCK TO DICKINSON, NEW SALEM AND RETURN	
DHET21503319	04/15/2015	MEYER,SHIRLEY J	04/01/2015	04/01/2015	STAFF PER DIEM	16.00
					STAFF TRANSPORTATION	86.70
					DICKINSON TO WATFORD CITY AND RETURN	
DHET21503320	04/08/2015	MORAST, KAYLEN A	03/31/2015	04/01/2015	STAFF TRANSPORTATION	100.00
					DICKINSON TO BISMARCK AND RETURN	
DHET21503328	04/15/2015	CARRANZA,MEGAN D	03/13/2015	03/13/2015	STAFF TRANSPORTATION	41.00
					BISMARCK TO WASHBURN AND RETURN	
DHET21503327	04/15/2015	MCCLOUD, NORMAN F	03/31/2015	03/31/2015	STAFF TRANSPORTATION	45.00
					GRAND FORKS TO MINOT AND RETURN	
DHET21503335	04/16/2015	HAND, GAIL S	04/09/2015	04/09/2015	STAFF TRANSPORTATION	79.50
					GRAND FORKS TO PEMBINA AND RETURN	
DHET21503336	04/17/2015	HEITKAMP,HEIDI	03/30/2015	04/13/2015	SENATORS TRANSPORTATION	871.20
					WASHINGTON DC TO GRAND FORKS, GRAND FORKS AFB, LARIMORE, GRAND FORKS, GRAND FORKS AFB, PEMBINA, GRAND FORKS, BISMARCK, FARGO, MINOT, BISMARCK AND RETURN	
DHET21503337	04/22/2015	EXECUTIVE AIR TAXI CORP	04/01/2015	04/01/2015	SENATOR'S TRANSPORTATION	2,989.70
					AIRMATE FOR SEN HEITKAMP BISMARCK TO GRAND FORKS	
DHET21503338	04/22/2015	EXECUTIVE AIR TAXI CORP	04/08/2015	04/08/2015	SENATOR'S TRANSPORTATION	5,093.38
					AIRMATE FOR SEN HEITKAMP BISMARCK TO FARGO, MINOT AND RETURN	
DHET21503339	04/08/2015	HAMPLE,BRYCE A	04/03/2015	04/10/2015	STAFF PER DIEM	64.23
					STAFF TRANSPORTATION	707.90
					WASHINGTON DC TO BISMARCK, DICKINSON, MANDAN, BISMARCK, MINOT, BISMARCK AND RETURN	
DHET21503340	04/04/2015	MCDONOUGH,ABIGAIL	04/15/2015	04/16/2015	STAFF TRANSPORTATION	13.00
					WASHINGTON DC OFFICE; INTERDEPARTMENTAL TRANSPORTATION	
DHET21503341	04/03/2015	MEYER,SHIRLEY J	04/15/2015	04/16/2015	STAFF TRANSPORTATION	37.10
					DICKINSON TO MEDORA AND RETURN	
DHET21503342	04/03/2015	MEYER,SHIRLEY J	04/13/2015	04/13/2015	STAFF PER DIEM	16.14
					STAFF TRANSPORTATION	65.30
					DICKINSON TO MANDAN AND RETURN	
DHET21503343	04/23/2015	KEYS,ROSS D	03/16/2015	03/27/2015	STAFF TRANSPORTATION	29.00
					WASHINGTON OFFICE; INTERDEPARTMENTAL TRANSPORTATION	
DHET21503344	04/24/2015	LONG,AMY E	04/14/2015	04/14/2015	STAFF PER DIEM	7.58
					STAFF TRANSPORTATION	50.00
					FARGO TO GRAND FORKS AND RETURN	
DHET21503345	04/23/2015	MCCLOUD, NORMAN F	04/09/2015	04/10/2015	STAFF PER DIEM	96.41
					STAFF TRANSPORTATION	111.00
					MINOT TO BISMARCK AND RETURN	
DHET21503349	04/23/2015	HEITKAMP,HEIDI	04/17/2015	04/20/2015	SENATOR'S TRANSPORTATION	478.20
					WASHINGTON DC TO MINOT, NEW TOWN, BISMARCK AND RETURN	
DHET21503350	04/09/2015	MCDONOUGH,ABIGAIL	03/30/2015	04/01/2015	STAFF PER DIEM	340.65
					STAFF TRANSPORTATION	872.25
					WASHINGTON DC TO GRAND FORKS AND RETURN	

B-1155

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Application of Agentic Coding in My Research

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- I don't want to do either, so I turn to Claude Code

- I compile all publicly available reports into a folder and open Claude Code in the same folder

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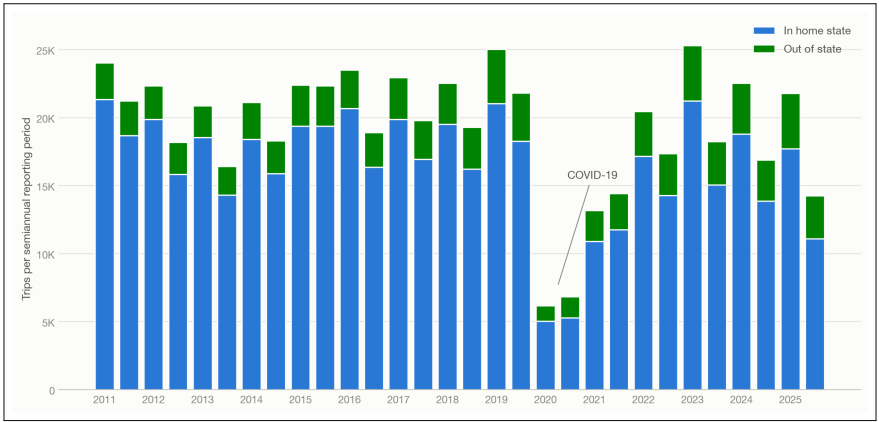
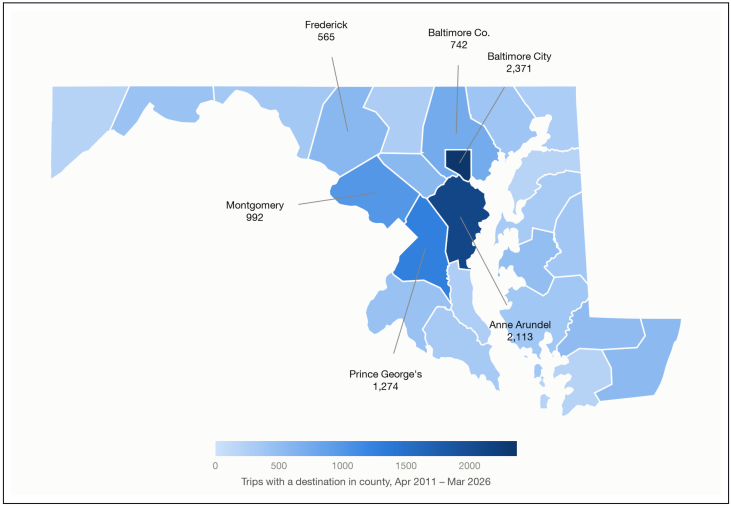
- The result: full coverage of all Senator and staff travel from April 2011 to March 2026, about 1 million total observations
- Total active working time: 3.2 hours

Distribution of Travel:



Two reporting periods per year. The final period ends in March 2026, so its bar covers only part of the year.

Where do Maryland Senators and their Staff Visit?



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- Scholars from even a few years ago would not have considered a project like this because of the hurdles
- The "big" ideas of the past are not limited to scholars at the most funded universities

- Understand the rules and policies put forth by the university, your professors, and PIs on how much or how little you can utilize these tools

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- **ALWAYS DOUBLE CHECK!**

Summary

- Introduction to Prompt Engineering

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- Familiarized yourself with what agentic coding can do

Summary

- Introduction to Prompt Engineering
- Familiarized yourself with what agentic coding can do
- Discussed the implications of AI in research

- Lee, Kyuwon, Simone Paci, Jeongmin Park, Hye Young You, and Sylvan Zheng. 2025. "Applications of GPT in Political Science Research: Extracting Information from Unstructured Text." *PS: Political Science & Politics*.

Questions?